Andrew J. Dunar; Stephen P. Waring. *Power to Explore: A History of Marshall Space Flight Center, 1960–1990.* (NASA History Series.) x + 713 pp., illus., figs., tables, apps., index. Washington, D.C.: NASA History Office, 1999. $49.

The Marshall Space Flight Center was established in 1960 and became a part of the National Aeronautics and Space Administration (NASA), itself only two years old. But this new NASA center was hardly a new institution. Rather, its establishment marked a change of command, as the Development Operations Division of the Army Ballistic Missile Agency was switched from military control to the civilian command of NASA.

By 1960, Marshall's staff numbered over forty-five hundred American engineers and technicians, but it also employed about a hundred German rocket engineers, people who had originally been brought to the United States as part of Project Paperclip following their involvement in Germany's V-2 rocket program in World War II. At the time Marshall was formed, this latter group had been working together for about twenty years, and its engineering "style"—with its emphasis on in-house work and very tight controls over firms contracted to do elements of the job—dominated Marshall's approach to building rockets and spacecraft, especially in its first decade or so. The leader of this group, Wernher von Braun, became Marshall's first director.

By 1958, von Braun and the staff at the Army's Redstone Arsenal in Huntsville, Alabama, had already become key actors in the American space program when a modified version of their Jupiter C missile became the launch vehicle for America's first Earth satellite, *Explorer I.* Marshall would, through its work with the giant *Saturn V* launch vehicle, go on to play a crucial part in the race to the Moon that dominated NASA's activities in the 1960s, as well as central roles in many of NASA's later programs, including Skylab (the first U.S. space station), the Space Shuttle program, the Hubble Space Telescope, and what in time became the International Space Station.

Andrew J. Dunar and Stephen P. Waring recount the first thirty years of Marshall's existence carefully and with clarity. *Power to Explore* is clearly the product of a very considerable body of research, including numerous oral history interviews. The bulk of the book describes Marshall's engagement in a variety of space projects, but it also encompasses a social history, with important sections devoted to the influence on the center of shifting attitudes to civil rights. These parts of the book underscore the authors' point that in launching the Apollo program, NASA also launched a reconstruction of the South.

Arguably the most controversial part of Marshall's history concerns its management of the solid rocket boosters of NASA's fleet of space shuttles, the failure of one of which during the launch of *Challenger* in 1986 led to disaster. From their many interviews with Marshall engineers, Dunar and Waring offer a perspective on the events surrounding this failure that varies somewhat from other published accounts.

Power to Explore is a significant addition to the literature on the history of U.S. spaceflight as well as a notable contribution to the writings about post–World War II institutions of science and technology more generally.

ROBERT W. SMITH

Shigeru Nakayama (Editor). With **Kunio Gotô** and **Hitoshi Yoshioka.** *A Social History of Science and Technology in Contemporary Japan.* Volume 1: *The Occupation Period, 1945–1952.* x + 632 pp., figs., bibl., index. Australia: Trans Pacific Press, 2001. $89.95 (cloth).

This is the first installment of the much-awaited translation of a multivolume work edited by the most eminent historian of Japanese science, Shigeru Nakayama, along with his colleagues Kunio Gotô and Hitoshi Yoshioka. It is quite appropriate that this first volume is devoted to the Allied Occupation of Japan. In the long preface to the volume, Nakayama provides a history of the larger project and an explanation of the four-sector approach that underpins it. He sees science and technology as the site where the different interests of the public (government), private (corporate), and academic (university) sectors converge with the concerns of citizens. The direction of science and technology is negotiated by these different sectors.

A great resource for the project (and other historians) has been Occupation Force documents, microfiche copies of which are on deposit at the National Diet Library in Tokyo. The first volume, beginning as it does with the Occupation, showcases some of the insights obtained regarding this formative period in Japanese history. Each chapter is written by an expert in the field; Nakayama is the author of many.

The book is divided into four parts: "GHQ and Demilitarization Policy," "Academic Research and Its System under the Occupation," "The Reorganization of Industrial and Social Systems,"

and "Scientists and Engineers in the Postwar Democracy." Topics covered include the destruction of cyclotrons, the Ishii Unit (Unit 731), scientist movements, and the establishment of the Science Council of Japan. Of particular interest to American readers will be topics such as the development of U.S.-inspired quality control in Japan, the role of U.S. advisory missions, and censorship of discussion and writing on the atomic bomb and its harmful effects.

While these topics have been discussed by others elsewhere—most notably by Keiichi Tsuneishi (a contributor to the volume and an expert on Ishii and his biological warfare unit), Bowen Dees (who worked in Japan during the Occupation), William Tsutsui (who has written on quality control), and Monica Braw (who has discussed censorship)—this volume will be very much welcomed by historians of science seeking a glimpse of recent Japanese scholarship in the field.

Although (like the Japanese original) this is more of a reference book to dip into than a sustained treatment calling for cover-to-cover reading, it is an indispensable guide for those who are interested in how Japan rebuilt its economy after the war and in the role of science, technology, and the Allied Occupation in helping to make a new Japan. The growth in the number of popular science magazines during this period, the establishment of scientist organizations, and attempts to implement a birth control program are all developments that have parallels elsewhere. This book offers scholars a chance to make useful comparisons that will, I hope, lead to a more cross-cultural history of science in the future.

MORRIS LOW

■ Sociology and Philosophy of Science

Gordon Graham. *Genes: A Philosophical Inquiry*. xii + 196 pp., bibl., index. London/New York: Routledge, 2002. $12.95 (paper).

The aim of this short treatment of genetic engineering is to bridge science, religion, ethics, and reflection on the social role of genetic science and technology: "My question is whether there is reason to think that the genetic revolution in science and technology is all that it is made out to be" (p. 20). More generally, Gordon Graham sets out to question the popular Janus-faced understanding of science and technology expressed in the contrasting icons of benevolent Einstein and evil Frankenstein. This is a worthwhile enterprise because the legal, ethical, and social implications of biotechnology cannot be assessed independently of assessing the actual scope and power of molecular biology. Unfortunately, as the author admits at the outset, his scientific understanding is limited, and the book ultimately only leads its readership from ignorance to misinformation.

Strangely, the chapter promised as an introduction to the basics of "genetic explanation" turns out to be an introduction to evolutionary biology—or, at least, to what the author takes evolutionary biology to be. Graham mistakes gene-centered versions of neo-Darwinism popularized by Richard Dawkins and Daniel Dennett for all there is to neo-Darwinism and, even worse, for all there is to evolutionary biology. Further, and more important for the aim of the book, he mistakes this extreme version of neo-Darwinism for all there is to "genetic biology." Graham either does not know about or chooses to ignore classical and molecular genetics, genomics, post-genomics, proteomics, and transcriptomics. Even within the limited range of "genetic explanations" he considers, he appears unaware of the important difference between explanatory agendas such as development, heredity, and evolution. At the end of this chapter we have learned nothing about what genes are and what they can or cannot do. Instead, we are told what neo-preformationist popular scientists such as Stephen Pinker wish genes to be, without any explanation of how actual molecules might perform the inflated functions assigned to them.

Among the glaring omissions in this picture of the current state of genetic and evolutionary biology are molecular developmental genetics and evolutionary developmental biology. These are the fields that are currently leading the way in understanding the relationship between genetics and evolution, and several excellent popular expositions of this work are available. Graham seems to believe that the only alternatives to the gene-centered neo-Darwinism he describes are creationism and the "theory of intelligent design." His discussion of the latter reveals that he does not know that irreducible complexity is likely to exist at many levels, not only the biochemical, and that this phenomenon can be tackled scientifically, via theories of complexity and self-organization. A similar problem afflicts Graham's account of naturalistic explanations of mental phenomena. Evolutionary psychology's view of naturalistic explanations of mental phenomena is only one among many—and one that has been widely and severely criticized in its attempt to reduce "nature" to genetic variation and natural selection. These and many